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Interactive comment on “Multi-station intercomparison of column-averaged methane from NDACC and TCCON: impact of dynamical variability” by A. Ostler et al.

Anonymous Referee #2

Received and published: 1 August 2014

General Comments

This manuscript assesses column-averaged dry-air mole fractions of CH₄ measured by mid-IR and near-IR FTIR spectroscopy as part of the NDACC and TCCON networks, respectively. It builds on a previous study by Sussmann et al. (2011) by expanding the number of sites from two to five, and investigates the reasons for seasonal biases. Data from an Arctic station (Ny Alesund) is used to evaluate the impact of stratospheric subsidence in the polar vortex, and data from a mid-latitude station (Garmisch) is used to evaluate the impact of stratospheric intrusions. When these dynamical effects are taken into account, the seasonal bias between the mid-IR and near-IR re-

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trievals is reduced and the agreement between the XCH4 products is improved. The study concludes that near-IR retrievals at polar stations may be improved by accounting for stratospheric subsidence in the a priori profile, while accounting for the impact of stratospheric intrusions on mid-IR retrievals is more challenging because of the varied nature of the processes involved. The manuscript is well written and provides a clear description of the intercomparisons and a discussion of the implications. The results are of interest to the NDACC and TCCON communities, and to users of these FTIR XCH4 datasets. I have only some minor suggestions and recommend publication in AMT after the points below are addressed.

Specific Comments

Page 6749, paras 1, 2, 3 – Since differences between the NIR and MIR XCH4 may be partly due to the spectral line lists, state which version of HITRAN or other line list is used for each set of retrievals. Which version of WACCM? 40-year run? Say how the dry pressure column is obtained for the MIR retrievals. Provide error estimates (precision and accuracy) for NIR and MIR XCH4.

Page 6751, line 1 – State briefly why monthly means were used. How would the results compare with daily or individual comparisons?

Page 6751, line 11 – State what the terms in brackets represent here, e.g., which decimal places they represent: 1.0002(12) for Garmisch, 1.0010(13) for Wollongong and 0.9996(13) for Karlsruhe

Page 6755, para 2 and Table 3 – The impact on XCH4 of excluding days influenced by the polar vortex seems very small – comment on this.

Page 6758, last para – Explain why none of the trajectories in Figure 8 pass through the blue box.

Page 6759, para 2 and Table 4 – Is the agreement significantly improved for the original a priori case? The slope for the Garmisch comparison using original a priori gets worse

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(1.0015 vs. 1.0001) without STE.

Page 6776, Table 2 caption – Make clear the significance of the (nn) 2sigma terms – what decimal places do these represent? State what the stdv is for.

Page 6780, Figure 2 – This figure is very small and the captions are unreadable.

Technical Corrections

Page 6745, line 20 – biomass

Page 6746, line 17 – AGAGE, and the network of the National ...

Page 6746, line 29 – Wunch et al., 2011a)

Page 6747, line 11 and page 6755, line 28 – chemical transport models

Page 6747, line 12 – dry-air

Page 6747, line 17 – the agreement obtained

Page 6748, line 8 – The NDACC Infrared Working Group

Page 6749, line 19 – delete “retrieval”

Page 6750, line 10 – define CTM

Page 6750, line 15 – add comma after “profiles” for clarity

Page 6751, line 16 – data sets

Page 6753, line 3 – The motivation for this ...

Page 6755, line 10 – slightly positive effects

Page 6755, line 24 – the extratropics

Page 6756, line 3 – ozone-related

Page 6757, line 4 – ozone-rich

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Page 6758, line 13 – coincident with

Page 6761, lines 2, 11, 14, 23, 29 – STE-events/processes – delete hyphens

Page 6765, line 1 – part of a technical

Page 6766, line 14 – We thank the Deustche . . . for support.

Page 6781, line 8 – retrievals using Ny-Alesund

Page 6783, line 2 – the station was inside

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